Biology

Baseline Cornerstone Assessment

The Cornerstone Assessments were developed with support through the VDOE Mathematics and Science Partnership Grant Program NCLB Title II, Part B program by high school teachers as a part of the Old Dominion University Learning Enhanced through the Nature of Science (LENS) project.

2012 – 2013

This assessment consists of two parts.

DIRECTIONS to provide to read to students:
Today you will be taking the Biology Baseline Cornerstone Assessment to find out your skills in scientific investigation, data analysis and interpretation, and scientific reasoning. Read each question carefully and provide your *best* answer or response.

Record your answers directly on the spaces provided in the assessment. Be sure your work and responses are legible.

Name:_____

Biology Baseline Cornerstone Assessment: Part A. Experimental Design

Directions: Read the paragraph below and then respond to the questions.

Students in a biology class were discussing outbreaks of food-borne illness. Modern practices of refrigeration are aimed at curbing these bacteria. They wanted to know exactly what happened to bacterial colony growth at varying temperatures. The teacher explained that scientists study bacteria in the laboratory by counting colonies that grow on plates filled with agar, which is a nutrient substance. Design an appropriate experiment to test the effect of temperature on bacterial growth. You will have 5 days to conduct your experiment. The following materials are available to you:

1. prepared agar plates
2. one freezer set to 0°C
3. one refrigerator set to 5°C
4. five incubators that can be set from 15 to 45 °C
5. classroom countertop (varying temperature from 25 to 30 °C)
6. tape
7. markers/wax pencils
8. prepared liquid bacteria (*E. coli*) culture in 500 mL flask
9. droppers/inoculating loop (for dipping into bacteria culture)
10. glass stir rods
11. balance
12. ruler
13. paper towels

1. State your **hypothesis**. Explain your reasoning.

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2. What should be the **independent variable** in the experiment? Explain your choice.

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3. What should be the **dependent variable** in your experiment? Explain your choice.

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Name:_____

4. Are there conditions that should **remain constant** in this experiment? Explain your answer, and give examples, if necessary.

5. Is there a need for a **control group** in this experiment? Explain your answer, and identify the control, if necessary.

6. Describe the procedures you will use to carry out the experiment. List the steps below and the materials needed.

7. Create a data table that can hold all the data you would gather through your experiment.

Name:_____

Biology Baseline Cornerstone Assessment: Part B. Data Analysis and Scientific Reasoning

Directions: Review the data table below. Then, answer the questions that follow.

The students believed that more bacteria colonies would grow at warmer temperatures. The data collected is listed below:

Temperature (°C)	Number of *E. coli* colonies after 5 days
0	0
10	12
20	22
30	88
40	198

1. Using the grid below, create a line graph from these data.

2. What is your **independent variable**? Explain your choice.

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_____

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Name:_____

3. What is the **dependent variable**? Explain your choice.

4. At what temperature do the most *E. coli* colonies grow? (Include units)

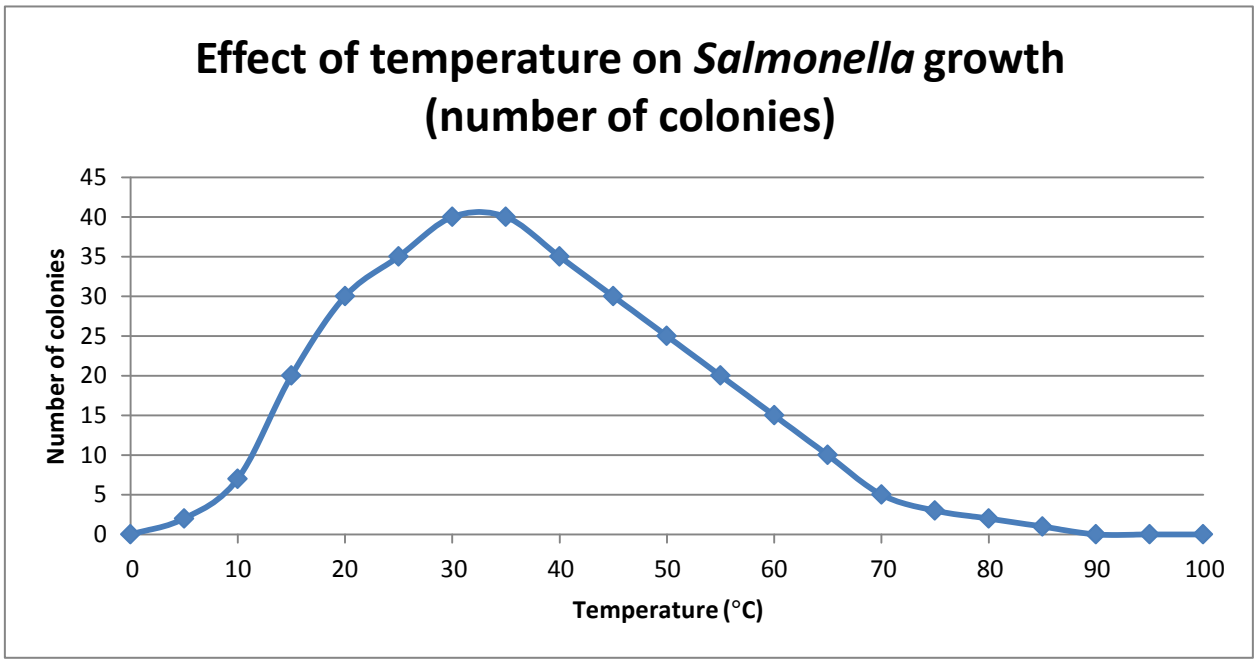
5. *E. coli* live in the intestinal tracts of many animals, including humans. Human body temperature stays at 37°C. How many bacterial colonies would you predict would be seen on the prepared agar plates if *E. coli* is grown at 37°C? Explain your reasoning.

6. Based on the data provided, what temperature prevents *E.coli* bacteria from growing ? Explain.

7. What conclusion(s) can be made based on these results?

8. Describe a way in which this experiment can be improved or expanded to further explore the effects of temperature on bacterial growth?

Name:_____



9. Describe what happens to the number of colonies as temperature changes.

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10. Within what temperature range do Salmonella grow the best?

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11. Salmonella is a type of bacteria that causes food poisoning. At what temperature should food be stored to prevent salmonella growth? Using data from the graph, explain your answer.

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